

## **Appendix 2.8 C**

### **Task 2.8 C: Technology Transfer Program**

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#### **Submitted to:**

California Energy Commission  
Sacramento, California

January 2002

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## **INTRODUCTION**

The technology transfer activities for the southern California consortium's electrotechnologies PIER project, funded by the California Energy Commission, is presented in this brief report. The purpose of this PIER project is to evaluate promising electrotechnologies to enhance water treatment. The consortium conducting the research work was represented by Southern California Edison (project management), Metropolitan Water District of Southern California, Orange County Water District, and EPRI's Community Environmental Center's Water and Wastewater (MWW) Program. Other participants include various California water and wastewater districts and the American Water Works Association Research Foundation. Discussion of the actual research work and results are presented in other reports.

The research work reflects the growing acceptance of the role of electrotechnologies in providing environmental, economic, and public health benefits. Research results should help to fully develop the potential of existing processes, such as membranes, while investigating cutting-edge processes, such as pulsed ultraviolet radiation, carbon aerogel capacitive deionization, and freeze-thaw conditioning. Source water includes surface water, agricultural drainage, reclaimed wastewater, and groundwater.

The Technology Transfer Program of the overall project provided opportunity for others (e.g. water utility operators, water quality researchers) outside the study team to follow the research effort as work proceeded and results were forthcoming. The technology information was presented and discussed in different formats including; brief technical reports, workshops, and professional meetings. Feedback received from the workshops has been reported herein.

In summary, the Technology Transfer Program provided the following:

- Communication of the research work to the appropriate professionals connected with the research, planning, design, and operation of water and wastewater systems

- A peer review and evaluation on the research work as it proceeded over the course of the project
- Feedback to the research team from other professionals on future research needs

## **DELIVERABLES**

As prescribed in the original scope and work plan for the Technology Transfer Program, a set of deliverables have been developed to document the activities of the Program's effort, to provide summary reporting of technologies evaluated, and identify results of the workshops. The following represents the deliverables for the Program.

- Six Technology Information Bulletins
- Written confirmation that the Bulletins have been distributed to appropriate audiences
- Copies of publicity brochures for each workshop
- List of attendees and their organization affiliations for each workshop
- Agendas identifying topics and speakers/presenters for each workshop
- An informal package provided to attendees for each workshop
- Copies of all evaluation questionnaires providing feedback on the quality of the workshop's contents
- Summaries of need assessments regarding future R&D research and technology needs

These deliverables are summarized in the following sections. The appendices provide detail for each.

### **Six Technical Information Bulletins**

Six summary reports were prepared covering selected research topics that were performed by research teams of the Consortium. The purpose was to present these technical concepts in a reader friendly format incorporating graphs and tables. The target audience for the reports include professionals, researchers, and academicians having interest and responsibility for using the technologies in the design and operations of water

and wastewater treatment and delivery systems. The subject topics for the bulletins include the following:

- Membrane Pretreatment of Reclaimed Wastewater for Reverse Osmosis Desalination
- Technologies for Improving Water Desalination for Municipal and Industrial Applications
- Pulsed-Ultraviolet Light for Drinking Water Disinfection
- Electrotechnologies for Micropollutant Control
- Energy Optimization in Water and Wastewater Treatment
- Mechanical Freeze-thaw and Freeze Concentration of Water and Wastewater Residuals

**Written confirmation that the bulletins have been distributed to appropriate audiences**

The process of distributing the bulletins involved providing them as handouts at the many water and wastewater seminars sponsored by EPRI's MWW Program, at the California Energy Commission's seminars, at workshops for the PIER project, and at seminars sponsored by the State's electric utilities. Bulletins were also provided to audiences of those technical conference sessions participated by Consortium members.

Below is a listing of the more significant seminars, conferences, and meetings that bulletins were distributed.

- CEC/PIER workshop, December 9, 1999
- MWW Program conference/meeting, Long Beach, February 7, 2000
- AWWA Cal/Nevada conference, October 26-27, 1999
- MWW Program conference/meeting, Minneapolis, June 21, 2000
- CEC/PIER workshop. May 3, 2000
- AWWA national meeting/ conference, June 11-14, 2000
- Water Environment Federation national meeting/conference, October 10-13, 1999
- PG&E/CEC seminar. Chico, April 25, 2000
- PG&E/CEC seminar. Turloch, April 26, 2000
- PG&E/CEC seminar. Fresno, April 27, 2000
- MWW Program conference/meeting, Dallas, September 27, 28, 29, 2000

Numerous copies were also provided to the CEC and California electric utilities for their distribution.

**Copies of publicity brochures for each workshop**

Three workshops were held to explain the research work, review progress, exchange information, and to obtain timely feedback from interested professionals. For each workshop, mailers were sent to approximately 2500 people extending an invitation to attend. A copy of the mailer/brochure is attached as Appendix B.

**List of attendees and their organization affiliation for each workshop**

Workshops were held at three different locations. Attendance at each and timing are given below:

LOCATION	ATTENDANCE
• Ontario on December 9, 1999	59
• Oakland on May 3, 2000	54
• Santa Ana on December 6, 2000	35

See Appendix C for attendee list of each workshop

**Agendas identifying topics and speakers/presenters for each workshop**

Speakers participating in the workshops came from the research team doing the day-to-day work. Each delivered presentations on the progress of their specialty topic. Mr. Lory Larson of Southern California Edison (Project Manager) served as workshop moderator. See Appendix D for copies of workshop agendas

**An informal package provided to attendees for each workshop**

At the time attendees registered for the workshop, each received a booklet that explained the purpose of the PIER program and the scope of the research for the subject PIER project. The booklet also contained copies of the technical presentations for the workshop. The booklet for each workshop is included in Appendix E.

**Copies of all evaluation questionnaires providing feedback on the quality of the workshop's content**

In general, each workshop was well received by attendees. Below are some issues which the attendees were asked to evaluate. The average score for each issue is also given. A score of "1" represents the least and a score of "5", the most.

ISSUE	SCORE		
	<u>12-9-99</u>	<u>5-3-00</u>	<u>12-6-00</u>
• venue meet expectations	4.2	3.4	3.6
• quality of information provided	4.4	3.9	3.9
• knowledge of the presenters	4.5	4.0	3.9
• technology information meet expectations.	4.4	3.8	3.7

Copies of all evaluation forms are included in Appendix F.

**Summaries of need assessments regarding future R&D research and technology needs**

At the workshops, the attendees were also asked to provide feedback on future needs including a) issues within the current effort requiring further supplemental research and b) other technologies not studied in the current work needing research. The results of this feedback is given below.

**Follow-up Issues Needing Future Research**

1. UV consistency and reliability
2. Real time monitoring of UV effectiveness
3. Accurate and reliable measurement of UV intensity
4. Use of UV to reduce color in water
5. By-products formed using UV/ozone/peroxide
6. Scale-up UV to larger projects
7. Re-growth of bacteria after UV disinfection
8. Full-scale use of chlorine resistant membrane
9. Brine collection and disposal

10. Long term effects of water reclamation
11. Consideration of storm water as a resource
12. Operations and maintenance costs for technologies studied
13. Energy efficiencies of technologies studied
14. Use of technologies for moderate and small utilities

#### Suggested New Research Needs

1. Perchlorate removal
2. Arsenic removal
3. Combination membrane filtration/bioreactors for nutrient removal
4. Use of bio-organisms to provide final treatment for small (septic) systems.
5. Biological lagoons
6. Radiation removal
7. Sub-surface discharge and reuse
8. Energy lost due to pumping on old degraded water pipes
9. NDMA removal with UV
10. Liquid membrane technology and MTBE removal
11. Impact of RO brine on ocean disposal

#### CONCLUSION

The technology transfer element of the southern California consortium research project successfully reached over 5000 professionals and others that potentially have interest or use of the research work that was done. This was accomplished via mailers announcing the workshops, presentations at seminars and conferences, and meetings of the EPRI's MWW program. The research team provided direct communication of the research work and findings at workshops held at three different locations during the course of the project.

Considerable valuable feedback was obtained from participants at the workshops representing various disciplines of the water and wastewater industry. The suggestions by the workshop attendees serve as basis for deciding projects for new research work for the industries.